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the *Pylorus* of which did strangely branch it self into two ranks in the Bowels. There was but one Liver, but big; for the rest, there were two Spleens, four Kidneys, two Wombs, full of a white matter, like a concremented *semen*: two *Vulva's*, with their distinct *Hymens*. In short, they were so well made in all the other Members, that the Painter, who was employ'd to draw them, affirm'd, That if they were done in Ivory, he would have paid any money for them.

The other Monster was a Boy, terrible to behold, born with his Breast open, the Bowels out of the Belly, the Leggs distorted, the Bladder in the place of the Fundament; in the Genitals, besides that the *Testiculi* were close to the Kidneys, there was nothing but a membranous expansion, wherein the Spermatick vessels were lost. Signor *Steno*, who honour'd me with his visit, saw the administration of it, which I had before made in the presence of many Noblemen and Physicians at my house.

V E N I C E,

Januar. 25.

1670.

Some Directions and Inquiries with their Answers,

Concerning the Mines, Minerals, Baths, &c. of Hungary, Transylvania, Austria, and other Countries neighbouring to those.

THe Directions and Inquiries, as they were, some time since, recommended by the Publisher to the care of the Ingenious and Learn'd Dr. Edward Brown (Son to that deservedly famous Physician Dr. Thomas Brown, and Fellow of the Royal Society) travelling in Germany, Hungary, Turkey, &c; are these.

To inquire in *Hungary*, *Transylvania*, *Austria*, and the other Countries thereabout, what is observable there, as to Minerals, Springs, Baths, Earths, Quarries, Metals; especially the kinds, qualities, and vertues of Mineral waters? Whether there be any medicated Earths? And what Coals, Salt-Mines, or Salt-Springs, Allom, Vitriol, Sulphur, and Antimony, those parts afford?

To inquire particularly, and to procure some of all the several sorts of Antimony, and Antimony-Ore, to be found in *Hungary*.

To procure some of the best *Hungarian* Vitriol, the *Cinnabaris nativa*; as also of the true Gold and Silver-Earth or Ore, said to be found at *Cranach* in *Hungary*.

To inquire after, and send over some of that kind of Vitriol, which by credible persons is affirmed to be found chrySTALLIZED in *Transylvania*.

To get a particular accompt of the Salt-Pits in *Transylvania*, which are said to yield two sorts of perfect Salt, the one being a *Sal Gemma*, the other, a common *Table-Salt*. To observe, how deep these Salt-Mines lie from the surface of the ground? How deep they have been digg'd hitherto? What dampes are met with in them? &c.

To inquire after the veins of Gold and Quick-silver at *Cremnitz* in *Hungary*; and after the vein of Silver at *Schemnitz* in the same Countrey: And to send some of the best Ores of them all.

Whether in all the Mines of Gold, Silver, Copper, Iron, Lead, in *Hungary*, and the adjacent Countries, and particularly about *Newhausel*, be everywhere found Quick-silver and Sulphur?

Whether it be true, that in the Copper-Mines of that place, which is call'd *Herrn-ground*, be found no Quick-silver at all?

Whether it be so, that in some parts of *Upper Hungary*, the Ores of Copper, Iron, Lead, be sometimes so commixt, that there is often found in the upper part matter of Iron, in the midst, of Copper, and in the lowermost, of Lead? And that

that in other places, Copperous fluors are mixt with Leaden ones?

Whether the Relation, communicated to the curious *Athanasius Kircher* (as may be seen in his *Mund. Subterr.*) viz. that the ductus's or veins of Metals, do in those parts sometimes run North and South, sometimes cross-ways, may be relied on?

To inquire into all the Baths of *Baden* and *Hungary*, and the manner of Bathing, used there: And particularly, Whether the water of the *Thermae*, that pass by *Schemnitz*, depose a certain Sediment, which in time turns into a yellow stone! And if so, to send over some of it.

These are the Queries; to which we shall now subjoyn the Answers of the above-mention'd curious Traveller, as they were imparted by him at several times, according as he had occasion to inform himself, when he was in those Parts, about such matters.

— I have not been unmindful of the Inquiries, you were pleas'd to honour me with upon the accompt of the *Royal Society*; and in Answer to them, I shall first acquaint you with what I found and learn'd of the *Salt-Mines*: concerning which I now present you with those two kinds of *Transylvanian Stone-Salts*, which you mention'd; and also with Salts out of the Mine at *Eperies* in Upper *Hungary*; together with some accompt of that Mine.

Of the *Sal Gemma* I have sent you four pieces, and a stone of Salt, as it was taken out of the Mine, which, if you please, for your further satisfaction, to break with an Hammer, you will find it to split into Tables or Parallelepipedons in your hand.

With these comes along a Specimen of that Mineral Salt, which is commonly used at Table. This is found in most of the Salt-Mines, as in that of the County of *Maromarus*, nigh to the Castle of *Hust*; and in one at *Dés*, in two at *Forda*, in two at *Calos*, in two at *Szick*, and in one at *Dizaknel*.

Great quantity of this Salt is brought down the River *Tibiscus*, and the Rivers running into it: Some of which is afterwards sent down the *Danube*, and up the *Morava* to furnish *Servia*, and the adjacent Provinces; and a great part of it up the *Danube* into *Hungary*; having myself seen divers Long-boats laden in many places between *Belgrade* and *Presburg*, but they come up no higher; Stone-salt being prohibited by the Emperour in *Austria*, who hath a considerable profit upon the boyled Salt brought from *Hall-stadt* in that Province.

In my Return from the Mine-Towns in *Hungary*, I met with Count *Rothall* at *Franfchin*, going then from the Emperour to treat with *Abaffi* Prince of *Transylvania* his Commissioners at *Eperies*: where I engaged some of his Attendants, not unknown to me, to make inquiry into the Salt-Mines of that place, or any other, according to the instructions I left with them; and afterwards I received an Accompt to this Effect.

Half an hours going from the City *Eperies*, there is a Salt-Mine of great note; from the first place of descent unto the bottom, it is about One hundred and fourscore fathoms deep: Into this the Miners descend first by Ropes, and at last by Ladders unto the lower parts. The Mine is for the most part in an Earthy, and not a Rocky ground.

The Veins of Salt are large, and there are pieces to be found of Ten thousand pound weight. They commonly hew out the Salt into Long square pieces of two foot in length, and one in thickness; and for use, it is broken and grinded between two grind-stones.

The Mine is cold and damp; but the Salt being a Stone-Salt, is not easily dissolv'd, or at least in any great quantity, by dampness or moisture: Yet the water of the Mine is impregnated with Salt in such sort, that being drawn out in large Buckets, and afterwards boyl'd up, it affords a blackish Salt, which they give to their Cattle in the Country.

The Colour of the ordinary Stone-Salt of this Mine is not very white, but somewhat grey; yet being broken and grind-
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ed to powder, it becomes as white as if it were refin'd : And this Salt consists of pointed parts or fossets. Another sort of Salt there is also, which consists of Squares and Tables; and a third, to be found of somewhat stirious or long shoots.

Nor is all the Salt of this Mine of one colour, but of divers; that which is found grossly mixt with the Earth, receives some colour from it. And even that, which is most pure, and resembleth Chrystal, doth often receive Tinctures of several colours. In the middle of a Chrystal-Salt with long shoots, I have seen a delicate *blew*; and Count *Rothal* hath a large piece of a fair *yellow*. There are also some pieces very clear and transparent, so hard, that they carve them into divers Figures, as Crosses, Crucifixes, and others. Of

** These are now in the Repository of the Royal Society; as are also the several Specimens of Ores, hereafter mention'd.*

each of these I have obtain'd a piece, and present the same unto you*; but cannot omit to advertise you, that, whereas these Salts, though kept without care, remain'd dry for many months in other Countries, yet they began somewhat to relent soon after I came into *England*; and if they be kept in a Stove, or very hot place, they will be apt to lose their Transparency. I could not hear of any *Damps* in this Mine.

But to proceed to the Gold-and Silver-Mines, I shall tell you, as to the *former*, That among the seven Mine-Towns in *Hungary* (which are not far from one another, *viz.* *Chremnitz*, *Schemnitz*, *Newsol*, *Koningsberg*, *Eochantz*, *Libeten* and *Tiln*) *Chremnitz* is the richest in *Gold*. They have also, at present, Gold-Mines at *Eochantz* and *Koningsberg*; and they report in that Countrey, that there hath been formerly a rich Gold-Mine at *Glas-bitten*, but lost, since that *Bethlem Gabor* over-ran those parts, when the Undertakers stopp'd up the Mine, and fled.

They have worked in the Gold-Mine at *Chremnitz* nine hundred years. This Mine is divers English miles in length, and about One hundred and sixty fathoms deep. Many veins of the Ore run to the *North*, and to the *East*. They work
also

also towards One, Two and Three of the Clock, as they speak; for the Miners direct themselves under ground by a Compass, not of 32 points (such as is us'd at Sea) but by one of 24; which they divide, as we do the hours of the day, into twice 12. Of the Gold-Ore, some is white, some black, red, or yellow: that with black spots in white is esteem'd the best, as also the Ore, which lieth next to the black veins. This Ore is not rich enough to suffer any proof in small parcels, like that of other Mines, whereby to know, what proportion of metal is contain'd in it; but they pound a very great quantity thereof, and wash it in a little River, which runs nigh the Town. The whole River being divided, and admitted into divers cuts, runs over the Ore continually, and so washeth away the earthy parts from the metallin; and from a clear River above the Town, by its running through so many works, and over so much pounded Ore, it becomes below the Town a dark yellow stream, of the colour of the earth of those hills.

There have been pieces of pure Gold found in this Mine; some of which I have seen in the Emperours Treasury, and in the Elector of *Saxony's* Repository; one piece as broad as the palme of my hand, and others less, and upon a white stone many pieces of pure Gold; but these are very rare.

The common yellow Earth of the Countrey near *Chremnitz*, although it be not esteem'd Ore, affords some Gold: And in one place I saw a great part of an Hill digg'd away, which hath been cast into the works, wash'd and wrought in the same manner, as pounded Ore, with considerable profit.

Some passages in this Mine, cut through the Rock and long disus'd, have grown up again; and I observ'd the sides of some, which had been formerly wide enough to carry their Ore through, to approach each other, so as we pass'd with difficulty. This happens in moist places. The passages unite not from the top to the bottom, but from one side to another.

There

There is Vitriol in this Mine, white, red, blew and green; and also Vitriolat waters. There is a substance found, which sticks to the Gold-ore, of small pointed parts like needles, call'd by them Antimony of Gold. There are Chrystals found here, and some tinctur'd yellow,

The Miners will not allow any Quick-silver or Brimstone to have been found here; yet in the lately mention'd Antimony of Gold there is evidently Sulphur, as you'll perceive by burning it. The Quick-silver-mine, mention'd in the Answer to *Kircher's* Inquiries in his *Mund. subterraneus*, is an *Hungarian* mile, or 7 English miles distant from *Cremnitz*, and is not wrought in at present.

There is a Vitriol-mine in these Hills nigh the Gold-mine; the Earth or Ore of it is reddish, and sometimes greenish. This Earth is infus'd in water, and after 3 dayes the water is powr'd off, and boyl'd 7 dayes in a leaden Vessel, till it comes to a thick granulated whitish substance, which is afterwards reduced to a *calx* in an Oven, and serveth in the making of *Aqua-fortis*, or the separating water, used at *Schemnitz*.

They have divers wayes of taking the Gold out of its Ore; by burning the Ore, by melting, by adding Silver-Ore and other Minerals, Sand and Lead; as they find the Ore fluid or fixt. But, to avoid prolixity, I will set down that way only, which they proceed in without Lead.

They break and pound the Ore, in water, very fine; they wash it often, and lay it in powder upon cloaths, and by the gentle oblique descending of the water over it, and their continual stirring it, the earthy, clayish, and lighter parts are washt away, while the heavier and metalline remain in the cloth. These clothes are afterwards washt clean in several Tubs, and the water, after some settling, powr'd off from its sediment; which sediment is again washt, and stirr'd up in several vessels and troughs, till at length they sprinkle Quicksilver upon it, and knead it well together, for an hour, and then washing it again in a wooden vessel, after the separating of much of it which the Quicksilver touches not; by striking this vessel against their leg, they bring the Gold and Quicksilver together, in an Amalgama, to one corner of it. From this Amalgama they strain as much of the Quicksilver as they can through coarse clothes first, and then through fine: they put the mass remaining upon a perforated Plate, which they set over a deep pan placed in the earth; in the bottom of which pan they also put quicksilver: This pan they cover, and lute the cover well, and then make a charcoal-fire upon it; they drive down the Quicksilver yet remaining in the Gold to the rest in the bottom of the pan; then taking out the Gold, they cast it into the fire, that it may still become purer.

Concerning *Cranach-Gold* (of which you particularly inquire) I cannot learn, that there is any such Gold, or place where Gold is digg'd, in *Hungary*; but in *Germany*, I think, there is: for *Agricola* mentions

such a place as *Golde-Cranachum* in his second Book *de veter. & novis Metallis* p. 400 *inter Francos*; and in his fifth Book *de Natura Fossilium* p. 254 mention is made of one place call'd *Golde-crona*, and another nam'd *Golde-Cranacum*.

Concerning the *Silver-mines*, there are divers of them at *Schemnitz* in *Hungary*, as the *Windschacht*, the *Trinity*, of *St. Benedict*, of *St. John*, of the *three Kings*, and several others of lesser note. The chiefeft and most wrought are those of *Windschacht* and *Trinity*.

They have no River here, but much water in the Mines, which is a double inconvenience to them, *viz.* to want water above, and to be glutted with it under ground, so as they are constrained to send much of their Ore to *Hodrytz* and other places, where are small Rivers, by which their Bellows and Hammers may be mov'd, their Ore pounded, washed, and other works requisite performed. Nor do they want Engins to pump the water out of the Mines, mov'd by wheels drawn about continually by horses, 12 horses at a time to each wheel.

In *Windschacht*-mine, deep in the earth, is a large wheel of 12 yards diameter, turn'd about by the fall of subterraneous waters. This wheel moves Engines, which pump out the water from the bottom of the Mine up to the cavity, wherein this wheel is placed. The water, which moves this wheel, falls no lower into the Mine, but passeth away through a *Cuniculus* made on purpose, through which both this & the other water, pump'd from the deepest parts of the Mine, do run out together at the foot of an Hill.

Trinity-Mine is 70 fathoms deep; built and kept open with under-work at a great expence. Much of this Mine being in an earthy soyl, the Ore of it is much esteemed. Divers veins lye *North*; and other rich veins run to the *North-East*. When two veins cross one another, they esteem it fortunate. So that all veins of Ore keep not the same point even in the same Mine; which would be an help to discover them; but they have no certain way to know either which way they run, or where they are, till by the industrious persevering in the labour of the Mines they are at last found out. They use not the *Virgula divina*, but dig alwayes as the Adventurers desire. They shew'd me one place, which they had digg'd streight on 6 years, when the Ore was but two fathoms distant from the place where they first began: And in another place they digg'd 12 years outright, and at last found a vein, which in a short time paid their charges

The blackish Silver Ore is esteem'd the best; much of it hath a mixture of a shining yellow substance or *Marchasite*, which if it be not in too great a quantity, is not unwelcom, by reason that it disposeth the Ore to fluidity or renders it more easie to be melted; but if it be in too great a proportion, they are of opinion, that it preys upon the Silver in the Mine, and in the Furnace carries it away while it melteth, by over-
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volatilizing it; and therefore they term it a *Robber*, as a substance which spoils, and takes away the richness of the Ore.

There is often found a red substance, which grows to the Ore, called *Cinnaber*, *Cinnaber of Silver*, *Cinnabaris nativa*, *Minium nativum*, or *Berg-cinober*; of which I have sent you some by it self, and some also sticking to the Ore. This substance grinded with oyl maketh a Vermillion, equal to, if not surpassing, the Cinaber made by Sublimation. I discover'd a Sulphur in it, by casting it upon an hot Iron-plate, on which it burned blew. Whether it also contains *Quick silver*, I have not try'd, because I would not diminish that small quantity, here sent. The Miners say they meet not with any.

There are also found in these Mines, Chrystals, Amethyfts or Amethystine mixtures in the clefts of the Rocks, and sometimes nigh or joyn'd to the Ore; as also Vitriol, naturally chrystalliz'd in the earth in divers of these Mines, and particularly in a Mine in *Paradise-hill* near *Schemnitz*.

As there is great variety in the Silver-ore, as to its mixtures with Earth, Stones, *Marchasite*, *Cinaber*, *Vitriol*, &c. so also in its richness, some holding a great proportion of Silver in respect of other. An 100 pound weight of ore sometimes yields but $\frac{1}{2}$ an ounce or an ounce of Silver; sometimes 2 ounces, 3, 4, 5, and unto 20 ounces. What is richer is very rare; yet some hath been found to hold half silver, and I have seen of it so rich, as to be cut with a knife.

A Specimen of each sort of Ore, which they dig out of the Mines, is carried to an Officer call'd the *Probierer*, who is to prove and judge of its richness; which he doth in this manner. Of all sorts of Ores he taketh the same quantity: the Ores being first dryed, burned, and pounded, he giveth an equal proportion of Lead to all, melteth and purifieth them, and then by exact scales takes notice of the proportion between the Ore and the Mettal contain'd in it, and reports it to those employ'd in the great melting Furnaces.

If the Ore be found to hold $2\frac{1}{2}$ ounces or more of silver in 100 pound weight, they ordinarily melt it without any foregoing preparation, by the help of *Iron-stone* (which is not Iron-ore, but a stone found thereabout, of which the liver-colour'd is the best,) *Kys* (a sort of *Pyrites*) and *Slacken* (a scum or cake taken off from the top of the pan, into which the melted Minerals run, and is a substance made out of the former mention'd, by fusion;) which are thrown in with it into the melting Furnace.

If the Ore be poorer, holding but two ounces in an 100 pound weight, or less, it is first pounded and washed, till it becoms richer, or hath a greater proportion of Metal in respect of the Ore, much of the earthy parts being washed away. Then it is thrown into the Furnace with the former Materials; and the *Marchasite*, which remains still with it, as sinking alwayes to the bottom with the silver in the wash-works, helps to the quicker fusion of the Ore.

Whatsoever is melted in the melting Furnace, is let out through an hole at the bottom thereof into the pan, which is plac'd in the earth before it, and, thus expos'd, it immediately acquires an hard scum, dross, loaf or cake, which being often taken off from the top, the metal remaining in it becoms purer; to which is added Lead, and after some time the melted metal is taken out. Then being again melted in the Driving Furnace, the Lead, or what else remains mixt with the Silver is driven off by the blowing two great bellows, and runs over in the form of Litharge: that which first comes over is the *White*, and that which last, being longer in the fire, is the *Red*, not that it is Litharge of Gold, both being driven off from the same metal.

As *Chremnitz* Gold-ore hath Silver in it, so most of the *Schemnitz* Silver-ore holds some Gold; which they separate by melting the Silver, then granulating it, and afterwards by dissolving it in *Aqua fortis*, whereby the Gold is left at the bottom, and is afterwards melted; the *Aqua fortis* is distilled from the Silver, and serveth again for use.

The Silver then separated from all its former associats, is sent to *Chremnitz*, where they coyn it into pieces of a mixt metal (which is the common Money of the Country,) after this manner: They melt it with about the same quantity of Copper, and run it into Bars, which they beat out; then softning them in the fire, draw them out to an exact thinness between two Steel-Wheels; then they cut them out into round pieces with an Instrument like a Shoemakers Punk, and then boil them with Tartar and Salt, shake them in a Sack with Small-coal and Water, dry them in a Kettle perforated, and afterwards they are drawn between two Wheels, in which they receive their Stamp.

So far this generous Travailer of the Hungarian Gold and Silver-mines: what he hath observed concerning the Copper-mines, and the Baths in those parts, we must referr to the next opportunity.

Some Inquiries relating particularly to the Bleeding of Walnuts; suggested by Dr. Ezerel Fonge in a Letter of his to the Publisher, of March 22. 1670.

AFTER I had been troubled a while at the Observation of Mr. *Wiloughby*, concerning *Sycamores* staying in hot, and running in cold weather, and had re-commended an *Hypothesis* to solve the *Phænomena*, and to reconcile the seeming repugnancy's*, he hath

* Of which in Namb.
57. p. 1165, 1166.

rais'd two other difficulties for me, of *Sycamores* running in *November*, and *Walnuts* never running but in cold weather: The former of which Observations puts me out of conceit of a *Salvo*, I found, and offer'd, in my publisht Papers, to *Birch* suppos'd to have run in *Autumne*, and found to have jell'd the hole



Philosophical Transactions

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